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HEALTH-RELATED QUALITY OF LIFE AND VISUAL AND COGNITIVE IMPAIRMENT AMONG NURSING HOME RESIDENTS

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Abstract

Aim—To examine whether the relationship between vision impairment and health-related quality of life (HRQoL) in nursing home residents is impacted by co-existing cognitive impairment.

Methods—This cross-sectional study involved a total of 382 English-speaking older adults (>55 years of age) with ≥ 13 on the Mini Mental State Exam (MMSE) from seventeen nursing homes in Birmingham, AL. Assessments were taken of visual acuity (Lighthouse Near Visual Acuity Test), cognition (MMSE), and health-related quality of life (Nursing Home Vision-Targeted Health-Related Quality of Life Questionnaire, VF-14, and the SF-36).

Results—A greater portion of participants had both vision and cognitive impairments (38.5%) as compared to those with neither impairment (21.5%), vision impairment alone (13.4%), and cognitive impairment alone (26.7%). Cognitive impairment did not modify the impact of vision impairment on HRQoL. The reduction in HRQoL associated with vision impairment was similar for those with and without cognitive impairment.

Conclusion—The deleterious impact of vision impairment on HRQoL in nursing home residents was not exacerbated by the co-occurrence of cognitive impairment. Aging-related visual impairment in nursing home residents is often reversible through treatment leading to improved HRQoL, and thus it is clinically important to know that cognitive impairment is unlikely to interfere with this benefit.

Keywords

Nursing Homes; Vision Impairment; Cognitive Impairment; Quality of Life

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INTRODUCTION

Visual and cognitive impairments are more common among older adults residing in nursing homes than among community-dwelling older adults. Rates of visual impairments in the nursing home range from 29% to 62%, [1,2] which is 3- to 30-times the rate in the community. [3–5] As many as 50% of nursing home residents have significant cognitive impairment, [6] a rate 2- to 10-times that among community-dwelling older adults, depending on age. [7] Both of these impairments in older adults have been linked to reduced health-related quality of life (HRQoL). [3,7–12] However, the majority of research in this area has been conducted in the community setting, investigating either visual or cognitive impairment alone but not the combined effects of both impairments. One study of community-dwelling older adults with no cognitive impairment and age-related macular degeneration found that individuals with advanced age, greater visual disability, and who were living alone, utilized greater formal care services, [13] a finding which explains why persons with vision impairment may be more likely to be admitted to a nursing home. [14]

What is even less clear is the relationship between visual and cognitive impairments among nursing home residents, a population having a high prevalence of both vision and cognitive impairment, and whether the presence of both impairments exacerbates the negative impact on HRQoL. Moreover, the majority of research to date has been limited to the functional dimension of HRQoL (i.e., activity difficulties) with little attention paid to the physical, social and psychological dimensions. The purpose of this paper is to examine whether the relationship between vision impairment and health-related quality of life (HRQoL) in nursing home residents is impacted by co-existing cognitive impairment.

METHODS

Participants

Participants were recruited from 17 licensed nursing homes in and around the Birmingham, AL area (16 for-profit and one non-profit). Recruitment procedures are described in detail elsewhere [4] and presented briefly here. Charge nurses at each facility identified potentially eligible residents for the study based on whether the resident was likely to be able to answer simple questions about vision and daily activities in the nursing home. All residents of the nursing homes, provided they met inclusion criteria, were eligible to participate in this study. Additional inclusion criteria were at least 55 years of age, spoke English, and a score on the Mini Mental State Exam (MMSE) ≥ 13 . Comprehension of simple requests for vision screening and questionnaire completion was critical to the validity of measures in this study. Since previous research has indicated that persons with mild to moderate cognitive impairment (MMSE scores ≥ 13) are able to reliably provide information regarding their health and well-being, [15] those with scores below 13, indicating more severe cognitive impairment, were excluded. A total of 382 participants met eligibility requirements for enrollment and agreed to participate. Characteristics of all persons approached for recruitment and screened for enrollment have been previously described in detail elsewhere. [4] The Institutional Review Board at the University of Alabama at Birmingham approved the study protocol and the study followed the tenets of the Declaration of Helsinki. Written consent was obtained from every participant as well as each resident's sponsor (family member or guardian) regardless of cognitive status.

Resident medical records were reviewed to obtain demographic information (age, sex, race/ethnicity, and education, also verified by interview) and current chronic medical conditions. Near visual acuity was assessed in each eye separately and together using the Lighthouse Near Visual Acuity Test (modified ETDRS) administered at 40 cm according to its standard protocol. Testing was carried out in either the resident's room or another private area with adequate

lighting. The resident used whatever correction he or she would normally use for tasks at a near distance in everyday life.

Measures of Health-Related Quality of Life

The Nursing Home Vision-Targeted Health-Related Quality of Life Questionnaire (NHVQoL), [11] specifically designed for the nursing home population, was used to assess vision-targeted health-related quality of life. This instrument consists of 9 subscales focusing on general vision, reading, ocular symptoms, mobility, psychological stress, ADLs, activities/hobbies, adaptation/coping, and social interaction. The VF-14 [16] was also used to assess vision-targeted health-related quality of life and focuses on difficulties in everyday tasks; it was originally developed for older adults with cataract but has been used with many older adult populations.[17] The Medical Outcomes Study Short-Form 36 (SF-36) [18] was used to assess generic HRQoL (both the physical and mental components). Scoring on all three of these instruments and their subscales/components ranges from 0 (representing severe disability) to 100 (representing no disability).

Criteria for Vision and Cognitive Impairment

Cognitively impaired participants were defined as those scoring less than 24 on the MMSE, the standard cut-off on this screening test for impairment. (Therefore, persons with cognitive impairment in this study had an MMSE score in the range: ≤ 23 to ≥ 13). Binocular near visual acuity worse than 20/60, a common definition for low vision, was used to define participants with visual impairment. We chose to focus on near vision impairment (as opposed to distance vision), as this impairment would be most relevant to a nursing home resident's everyday task ability in the immediate surrounding of their rooms (e.g., reading, self-care activities, social interactions in their rooms). Both visual and cognitive impairments have been shown to diminish one's capacity to engage in these types of activities, which in turn affects physical, mental, and psychosocial well-being and self-perceptions of HRQoL.[8,11,19] Participants were then classified into the following four categories for analytical purposes: 1) No vision impairment/no cognitive impairment; 2) Vision impairment/no cognitive impairment 3) Cognitive impairment/no vision impairment; or 4) Vision impairment/cognitive impairment.

Statistical Analysis

Multiple linear regression was used to estimate the association between vision and cognitive impairment and HRQoL scores adjusted for the potentially confounding effects of age, gender, race, and number of chronic medical conditions. To evaluate whether the joint effect of vision and cognitive impairment had an impact on HRQoL scores beyond their individual effects, an interaction term was included in the multiple linear regression models. P-values ≤ 0.05 were considered statistically significant. The available sample size (N=382) allowed us to detect as significant interactions that included between group differences in NHVQoL, VH-14 or SF-36 scores of 10 or more with adequate power (~70%).

RESULTS

Table 1 presents demographic characteristics, MMSE scores, and the number of medical comorbidities according to impairment group. Relatively few participants had vision impairments alone (13.4%), while 21.5% had neither vision nor cognitive impairment, 26.7% had cognitive impairment alone, and the largest group had both cognitive and vision impairments (38.5%). The majority of participants were females (81.2%) of white, non-Hispanic origin (74.1%) in their 70's or 80's (74.1%). Nearly half (48.7%) of participants had at least a high school education. Participants had an average of 5–6 chronic medical conditions. Impairment groups differed significantly in age ($p = 0.02$), race/ethnicity ($p = 0.002$), sex ($p = 0.02$), and education ($p < 0.0001$), with the dually impaired group and cognitively impaired

group tending to be older, African American, and have less education. Relatively few men had visual impairment alone compared to the other groups. All groups were similar in terms of the number of chronic medical comorbidities.

Table 2 presents the mean scores on the HRQoL instruments according to vision and cognitive impairment. With one exception, cognitive impairment does not appear to modify the impact of vision impairment on HRQoL. That is, the reduction in HRQoL associated with vision impairment is similar for those with and without cognitive impairment. The one exception is the ocular symptoms score on the NHVQoL instrument. Among subjects without cognitive impairment vision impairment is associated with higher scores (less disability) on the ocular symptom subscale; conversely among those with cognitive impairment, vision impairment is associated with lower scores (more disability).

DISCUSSION

The co-existence of visual impairment and cognitive impairment in older adult nursing home residents is a common finding.[2] Cognitive impairment is seen in greater frequency among nursing home residents with visual impairments than in those without. Likewise, of people with vision impairment in the present study, almost 75% also had cognitive impairment, whereas about half of persons without vision impairment had cognitive impairment. Our findings also reflect typical relationships between visual and cognitive impairment and demographic variables, where both the prevalence of vision impairment and of cognitive impairment increase with age and are more prevalent in women, African-Americans, and those with less education.[1,7,19–21]

This is the first study to our knowledge to examine the joint effect of visual and cognitive impairments on HRQoL in nursing home residents. It was hypothesized that having both impairments would lead to greater threats to HRQoL than having either impairment alone. However, the results of this study did not confirm this hypothesis. We found that the existence of cognitive impairment does not modify the effect of vision impairment on HRQoL. Vision impairment was associated with lower HRQoL to no significantly greater degree in those with cognitive impairment than it was in those without cognitive impairment. This is similar to the findings of Whitson and colleagues [9] who explored the effect of having both visual and cognitive impairments on the outcome of disability in community-dwelling older adults. They also found that these impairments did not act synergistically, rather their negative effect on disability was additive and independent from one another. It appears that HRQoL in nursing home residents with MMSE scores of ≥ 13 is driven more by visual ability rather than cognitive ability. Real and colleagues also found that in individuals who were willing to trade hypothetical time from their life in order to cure their visual disability, their quality of life was determined primarily by this visual disability even in the presence of other comorbid diseases, showing the strength of the effect of visual impairment on perceptions of quality of life. [22]

Strengths of the study are as follows. Our measures included both disease specific (NHVQoL and VF-14) and general (SF-36) measures of HRQoL addressing all 4 domains of QoL (i.e., physical, functional, psychological, and social). Our study contributes to a gap in the literature as previous studies on nursing home residents have not examined the joint effect of sensory and cognitive impairments on HRQoL in more than the functional domain. Additionally, one of the vision-specific measures of HRQoL used in this study, the NHVQoL, is specifically designed for use with older adult nursing home residents. Traditional vision-specific HRQoL measures have been geared towards community-dwelling persons of varying age groups and eye conditions. The NHVQoL targets issues of HRQoL of particular importance to nursing home residents such as ocular symptoms and basic ADLs, while omitting non-relevant issues related to driving and household care.[11] providing a more valid interpretation of HRQoL

based on real-world visual needs of nursing home residents. Had a dementia specific HRQoL questionnaire been used in the present study, a larger effect of cognitive impairment on HRQoL may have been observed as dementia specific HRQoL questionnaires target QoL issues most pertinent to persons with cognitive impairment.[15]

Study limitations must also be acknowledged. Cognitively impaired participants provided self-reports of HRQoL. However, it has been previously shown that persons with MMSE scores as low as 13 can reliably provide information regarding HRQoL.[15] Furthermore, the NHVQoL was validated in a similar sample of cognitively diverse nursing home residents (mean MMSE of 20, range 6–30) finding that subscale scores did not differ as a function of MMSE score. [11] Persons with MMSE <13 were excluded in the present study in an effort to enhance validity and reliability of self-reports. As a result, the findings of this study are not generalizable to individuals with severe dementia and the exclusion of this group could have biased prevalence estimates of visual impairment, a challenge for future research.

The findings from the current study have important implications for both clinical practice and future research. Both the American Academy of Ophthalmology [23] and the American Optometric Association [24] recommend that all older adults have annual or biannual eye exams, which equally applies to older adults residing in nursing homes. This recommendation, specific to nursing home residents, has appeared in the literature for over 30 years [25] and has yet to be widely implemented.[4] This study found that vision impairment adversely affected HRQoL both with and without the presence of cognitive impairments. This is an important finding because while aging-related cognitive impairments are largely irreversible, many visual impairments are remediable through refractive error correction and cataract surgery.[10,12] This is clinically practical, because in addition to cognitively intact individuals, older adults with cognitive impairment can also benefit from these eye care interventions.[26] Additionally, improved vision among nursing home residents of varying levels of cognitive status has led to improvements in HRQoL.[10] Previous studies have shown that nursing home residents who had vision optimally corrected with low vision aids were less functionally impaired than their uncorrected peers,[27] and others have recommended consulting with nursing home facilities to encourage environmental modifications (e.g., proper illumination and staff training in low vision rehabilitation) to aid visually impaired residents.[28] This is important because improved vision in cognitively impaired individuals could also lead to reductions in the level of care they require from nursing staff .[1] Future work is needed in this area to establish and enact policies to provide nursing home residents (including those with cognitive impairments) with regular eye exams and ensure their access to appropriate corrective measures.

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REFERENCES

1. Tielsch J, Javitt J, Coleman A, et al. The prevalence of blindness and visual impairment among nursing home residents in Baltimore. *N Engl J Med* 1995;332(18):1205–1209. [PubMed: 7700315]
2. Mitchell P, Hayes P, Wang J. Visual impairment in nursing home residents: The Blue Mountains Eye Study. *Med J Aust* 1997;166:73–76. [PubMed: 9033561]
3. Crews J, Campbell V. Vision impairment and hearing loss among community-dwelling older americans: Implications for health and functioning. *Am J Public Health* 2004;94(5):823–829. [PubMed: 15117707]
4. Owsley C, McGwin G, Scilley K, et al. The visual status of older persons residing in nursing homes. *Arch Ophthal* 2007 July;125(7):925–930. [PubMed: 17620572]

5. Tay T, Wang J, Kifley A, et al. Sensory and cognitive association in older persons: Findings from an older Australian population. *Gerontology* 2006;52:386–394. [PubMed: 16921251]
6. Ferrell B. The management of pain in long-term care. *Clin J Pain* 2004;20(4):240–243. [PubMed: 15218408]
7. Black SA, Rush RD. Cognitive and Functional Decline in Adults Aged 75 and Older. *J Am Geriatr Soc* 2002;50:1978–1986. [PubMed: 12473009]
8. Resnick H, Fries B, Verbrugge L. Windows to their world: The effect of sensory impairments on social engagement and activity time in nursing home residents. *J Gerontol B Psychol Sci Soc Sci* 1997;52B(3):S135–S144. [PubMed: 9158570]
9. Whitson H, Cousins S, Burchett B, et al. The combined effect of visual impairment and cognitive impairment on disability in older people. *J Am Geriatr Soc* 2007;55:885–891. [PubMed: 17537089]
10. Owsley C, McGwin G, Scilley K, et al. Impact of cataract surgery on health-related quality of life in nursing home residents. *Br J Ophthalmol* 2007;91:1359–1363. [PubMed: 17522143]
11. Dreer L, McGwin G, Scilley K, et al. Development of a nursing home vision-targeted health-related quality of life questionnaire for older adults. *Aging Ment Health* 2007;11(6):722–733. [PubMed: 18074260]
12. Owsley C, McGwin G, Scilley K, et al. Effect of refractive error correction on health-related quality of life and depression in older nursing home residents. *Arch Ophthalmol* 2007;125(11):1471–1477. [PubMed: 17998508]
13. Ke KM, Montgomery A, Stevenson M, et al. Formal and informal care utilisation amongst elderly persons with visual impairment. *Br J Ophthalmol* 2007;91:1279–1281. [PubMed: 17360732]
14. Wang JJ, Mitchell P, Smith W, et al. Incidence of nursing home placement in a defined community. *Med J Aust* 2001;174(6):271–275. [PubMed: 11297113]
15. Brod M, Stewart AL, Sands L, et al. Conceptualization and Measurement of Quality of Life in Dementia: The Dementia Quality of Life Instrument (DQoL). *Gerontologist* 1999;39(1):25–35. [PubMed: 10028768]
16. Steinberg E, Tielsch J, Schein O, et al. The VF-14. An index of functional impairment in patients with cataract. *Arch Ophthalmol* 1994;112(5):630–638. [PubMed: 8185520]
17. Linder M, Chang T, Scott I, et al. Validity of the visual function index (VF-14) in patients with retinal disease. *Arch Ophthalmol* 1999;117:1611–1616. [PubMed: 10604665]
18. Ware JJ, Sherbourne C. The MOS 36-item short-form health survey: I. Conceptual framework and item selection. *Med Care* 1992;30:473–483. [PubMed: 1593914]
19. Age-Related Eye Disease Study Research Group. Cognitive Impairment in the Age-Related Eye Disease Study. *Arch Ophthalmol* 2006;124:537–543. [PubMed: 16606880]
20. Busse A, Sonntag A, Bischof J, et al. Adaptation of dementia screening for vision-impaired older persons: Administration of the Mini-Mental State Examination (MMSE). *J Clin Epidemiol* 2002;55:909–915. [PubMed: 12393079]
21. Klein R, Klein B, Linton K, et al. The Beaver Dam Eye Study: Visual acuity. *Ophthalmology* 1991;98(8):1310–1315. [PubMed: 1923372]
22. Real FJ, Brown GC, Brown HC, et al. The effect of comorbidities upon ocular and systemic health-related quality of life. *Br J Ophthalmol* 2008;92:770–774. [PubMed: 18420747]
23. American Academy of Ophthalmology Preferred Practice Patterns Committee. Comprehensive adult medical eye evaluation. San Francisco: American Academy of Ophthalmology; 2005. Preferred Practice Patterns Guidelines. Available at: <http://www.aao.org/ppp>
24. Comprehensive Adult Eye and Vision Examination. St. Louis: American Optometric Association; 2005. American Optometric Association Consensus Panel on Comprehensive Adult Eye and Vision Examination. Available at: www.aoa.org/documents/CPG-1.pdf.
25. Snyder L, Pyrek J, Smith K. Vision and mental function in the elderly. *Gerontologist* 1976;16(6):491–495. [PubMed: 1021533]
26. Teresi J, Morse AR, Holmes D, et al. Impact of a vision intervention on the functional status of nursing home residents. *J Vis Impair Blind* 2005;99:96–108.
27. de Winter L, Hoyng C, Froeling P, et al. Prevalence of remediable disability due to low vision among institutionalized elderly people. *Gerontology* 2004;50:96–101. [PubMed: 14963376]

28. Deremeik J, Broman A, Friedman DS, et al. Low vision rehabilitation in a nursing home population: The SEEING Study. *J Vis Impair Blind* 2007;101(11):701–714.

Table 1
Demographics of the Study Enrollees by Impairment Group

Characteristic	Impairment Group				p
	No Impairment N=82 (21.5%)	Vision Impairment Only N=51 (13.4%)	Cognitive Impairment Only N=102 (26.7%)	Vision and Cognitive Impairments N=147 (38.5%)	
Age, y					0.02
60–69	15 (18.3)	7 (13.7)	7 (6.9)	10 (6.8)	
70–79	31 (37.8)	20 (39.2)	24 (23.5)	46 (31.3)	
80–89	30 (36.6)	17 (33.3)	50 (49.0)	65 (44.2)	
90–99	5 (6.1)	7 (13.7)	20 (19.6)	26 (17.7)	
≥100	1 (1.2)	0 (0.0)	1 (1.0)	0 (0.0)	
Race/Ethnicity					0.002
African American	11 (13.4)	8 (16.0)	35 (34.3)	45 (30.6)	
White	71 (86.6)	43 (84.3)	67 (65.7)	102 (69.4)	
Sex					0.02
M	22 (26.8)	3 (5.9)	17 (16.7)	30 (20.4)	
F	60 (73.2)	48 (94.1)	85 (83.3)	117 (79.6)	
Education					<0.0001
Grade school	3 (3.7)	2 (3.9)	37 (36.3)	61 (41.5)	
Some high school	24 (29.2)	10 (19.6)	21 (20.6)	27 (18.4)	
High school graduate	34 (41.5)	19 (37.3)	26 (25.5)	41 (27.9)	
Some college	11 (13.4)	16 (31.4)	14 (13.7)	9 (6.1)	
College graduate	6 (7.3)	3 (5.9)	2 (2.0)	1 (0.7)	
Graduate or professional degree	2 (2.4)	1 (2.0)	0 (0.0)	1 (0.7)	
MMSE score*					--
27–30	35 (42.7)	15 (29.4)	0 (0.0)	0 (0.0)	
24–26	47 (57.3)	36 (70.6)	0 (0.0)	0 (0.0)	
20–23	0 (0.0)	0 (0.0)	51 (50.0)	50 (34.0)	
16–19	0 (0.0)	0 (0.0)	28 (27.4)	53 (36.0)	

Characteristic	Impairment Group			p
	No Impairment	Vision Impairment Only	Cognitive Impairment Only	
	N=82 (21.5%)	N=51 (13.4%)	N=102 (26.7%)	
13-15	0 (0.0)	0 (0.0)	23 (22.5)	44 (29.9)
No. of medical conditions, mean (SD)	5.9 (2.9)	6.1 (2.9)	5.2 (2.9)	5.5 (3.1)

* Mini Mental State Exam (MMSE) score <24 indicates cognitive impairment

Table 2
 Combined Effect of Vision and Cognitive Impairment on HRQoL

Variable	No Cognitive Impairment		Cognitive Impairment		p
	No Vision Impairment	Vision Impairment	No Vision Impairment	Vision Impairment	
NHVQoL, mean					
General vision	71.4	58.5	66.6	55.4	0.674
Reading	88.8	71.6	86.8	68.5	0.839
Ocular symptoms	72.8	75.2	76.5	65.2	0.02
Mobility	91.2	86.2	89.8	82.5	0.449
Psychological distress	77.3	66.4	70.9	61.3	0.770
Activities of daily living	97.9	93.8	98.0	92.8	0.714
Activities and hobbies	94.2	83.5	92.2	82.2	0.843
Adaptation and coping	93.0	85.5	86.0	75.8	0.594
Social interaction	96.4	89.1	94.2	84.9	0.541
VF-14, mean	88.5	75.0	89.4	73.6	0.602
SF-36, mean					
Mental component summary	57.1	55.3	54.5	51.2	0.504
Physical component summary	35.2	33.9	34.7	34.9	0.310

Means are adjusted for age, sex, race/ethnicity, and number of medical conditions

NHVQoL= Nursing Home Vision-Targeted Health-Related Quality of Life Questionnaire

p= interaction effect of both impairments